



Energy Commission
June 30, 2014



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Advanced Vehicle & Infrastructure Policy

General Motors | PEV Products



HEVs, PHEVs and BEVs have delivered functionality and emotional appeal to meet early customer needs.



The Most Fuel-Efficient Vehicle Available in the U.S. – EPA

"Quite possibly the best all electric small car on the market." – AutoGuide

"Once you drive it, there's no question this motor's got muscle." – Car And Driver

"The (Spark) EV feels crazy quick, with 400lb-ft of torque, and a relatively small and light car, it just gets up and goes." – Consumer Reports



"We think that it's not just one of the best-driving electric cars yet, but one of the most affordable ways yet to make your daily driving completely gasoline-free."

– Green Car Reports



- Green Car Journal – 2014 Green Car Technology Award Regen On Demand
- 2013 Eyes on Design winner Best Production Car
- "Acceleration is smooth and constant and even the best automatic transmissions can't match a shiftless experience." – Motor Trend



My 2014 Volt - "Volt"
 VIN 1G1RB6E43EU127902

CHARGING STATUS

Vehicle data as of 02/05/14 at 11:40 AM EST | [Refresh](#)

Current Charge Mode:
 Update your Charge Mode and become grid-friendly using the wizard below.

- ☒ Immediate
 Charge starts upon plug-in.
- ☐ Delayed - Departure Time
 Charge your vehicle based on departure time.
- ☐ Delayed - Rate and Departure Time
 Charge your vehicle based on departure time and utility rates.

[SAVE](#)

[LAUNCH WIZARD →](#)

 Plugged in (120v)

Estimated Full Charge By:
 12:00 PM

Estimated Electric Range:
 28 Miles
 Estimated Total Range:
 206 Miles



[CHARGE NOW](#)

[VIEW CHARGING DETAILS →](#)

STATUS



Charging



Efficiency



Mileage

COMMANDS



Door Lock



Door Unlock



Remote Start



Cancel Remote Start



Horn & Lights

EFFICIENCY

Vehicle data as of 02/05/14 at 11:50 AM EST

Last 30 Days:

Electric Miles:
 498

Gas Miles:
 143

Total Miles:
 641

Percentage on Electric:
 78%

Fuel Economy:
 66 MPG

Electric Economy:
 43 kW-hr / 100 miles

Combined Economy:
 39 MPGe

Est. Gallons Fuel Saved:
 0 gal

Est. CO₂ Avoided:
 0 lbs

Vehicle Life:

Electric Miles:
 2,094

Gas Miles:
 687

Total Miles:
 2,781

Percentage on Electric:
 75%

Fuel Economy:
 82 MPG

Electric Economy:
 -- kW-hr / 100 miles

Combined Economy:
 -- MPGe

Est. Gallons Fuel Saved:
 73 gal

Est. CO₂ Avoided:
 1,426 lbs

STATUS



Charging



Efficiency



Mileage

COMMANDS



Door Lock



Door Unlock



Remote Start



Cancel Remote Start




Horn & Lights

LAST VEHICLE COMMAND

No commands sent this session

TIRE PRESSURE

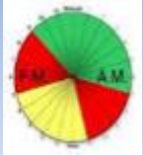
 Tire Pressure: Low (Add Air)

Recommended tire pressure - Front:38psi, Rear:38psi



- Keeping your tires properly inflated is essential to maximizing your overall energy efficiency. Properly inflated tires are also safer and last longer.
- One or more tires are low and need air. Inflate them to the recommended tire pressure listed above next

Vehicle-to-Grid | OnStar Smart Grid Connectivity



Time of Use

Utility administration can update and sync enrolled consumer TOU rates in the vehicle with changes that occur in the market based on supply and demand



Fleet Management

A single mobile app or web application that provides current energy state of each vehicle that is a member of the designated Fleet



Aggregated Services

Manage and address Grid Load Management from the perspective of the Energy Service Provider for an identified Region



Renewables

Renewable Energy Service Providers can partner with Onstar as the first Telematics provider that has developed a renewable energy management solution for fleets and the individual consumer



Demand Response

Energy Service Providers make informed maintenance and operational choices to control and automate energy usage control



Ancillary Services

Leverage vehicle batteries to provide Grid Operators with key grid management services, such as frequency regulation.



API

Provides a way by which developers and engineers can create innovative and new experiences via the OnStar ATOMS cloud.

Vehicle-to-Grid | Demonstration Partners



Vehicle-to-Grid | California Public Utility Commission

General Motors engage in the following CPUC Proceedings:

Encourage Energy Commission Staff to review dockets for automaker priorities and considerations.

R.09-08-009 Alternately-Fueled Vehicle Proceeding (**closed**)

- Learning, Priorities, Roles / Responsibilities, Sub-metering

R.13-11-007 Alternately-Fueled Vehicle Proceeding (**open**)

- Vehicle-Grid Integration (definition, framework, priorities), Rate-design

R.14-02-006 Energy Storage Procurement Framework

(and related)

- Definitions, additional considerations

Key Message with respect to Vehicle-to-Grid Services:

The potential value for these services is being evaluated (*piloted, defined*).

V1G may be more easily implemented and the rules/requirements for V2G are being characterized, which will impact the business case for each party.

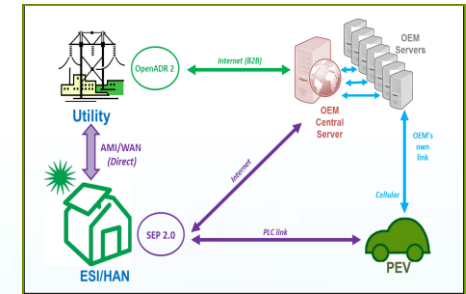
PEV Infrastructure | What We Have Learned

- **Infrastructure is necessary, but alone is not sufficient**
 - Infrastructure Priority: Home → Work → Public
- **PEV Drivers want inexpensive, convenient charging**
 - Simple—120V outlets are available and convenient
 - Convenient—DC Fast when and where you need it
 - Easy—Transparent, effortless devices & utility pricing
 - Suitable—Vehicle control responds to signals, needs, vehicle status
- **Harmonize (single) infrastructure standards**
 - Common infrastructure experience and interaction everywhere
 - Streamlined customer interfaces – optimized for plug & play
- **Willing to participate in utility programs**
 - Automate, easy to control & make choices, real-time
- **Good data is critical...continuously evolve (flexibility)**

Focus on technologies that standardize, simplify and lower cost
Significant need for a common interface platform

Vehicle-to-Grid | Open Unified Vehicle/Grid Integration Platform

- **VGI requires a common interface architecture**
 - Standards based interoperable protocols to enable communications between all stakeholders
 - Foundation to test VGI use cases (V1G – V2G)
- **Common Interface Architecture Concept defined**
 - Consensus among 8 OEMs, EPRI, and multiple major IOUs (including all California IOUs)
 - Provides open unified interface platform to aggregated and individual OEM vehicles
 - Communications interface between PEV/Utility, PEV/EVSP, PEV/Facility EMS, PEV/ISO
 - Enable DR, RTP, Ancillary Services, Automated Distribution Load Management, Renewables Integration, etc. - multiple use cases
- **Phase 1 initiated – Basic architecture using standard protocols to validate DR services - Utility to PEV communications through OEM Central Server**
- **Phase 2 required to extend architecture and stakeholder participation to implement and test complete feature sets of standards for PEV load management communications and control**



CEC funding to support Phase 2 should be strongly considered

Vehicle-to-Grid | Open Unified Vehicle/Grid Integration Platform

Expected Outcomes

- Validation of standard protocols and interoperability utilizing diverse transfer mediums – Wifi/PLC/Cellular
- Validation of interface requirements with utilities, residential AMI/HAN, facilities' EMS communications devices/gateways, etc.
- Viability of PEVs to function as resource for aggregations services –value
- Validate Central Server technology solution for providing a *unified open source platform* for PEV/Grid communications
- Customer Engagement requirements/needs – enhanced PEV adoption
- Extensibility to interface and interoperate with EVSE Networks / Protocols, stationary battery energy storage systems (Residential/Commercial), and Solar PV Systems that provide energy resources for integrated Smart Charging
 - Leading to V2G control communications and functionality
- Foundation for regulatory consensus on a common communications architecture that enables both utility and 3rd party market participation.

Influence a national consensus with California example and leadership

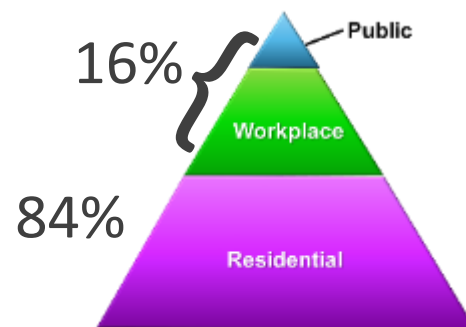


 **VOLT**

Home vs. Work vs. Public Charging

Study Period 1/1/2012 – 12/31/2013

- Overall EV drivers:
 - 84% of all charging events are at home
 - 16% not at home



- When workplace charging is available:

96 Volts

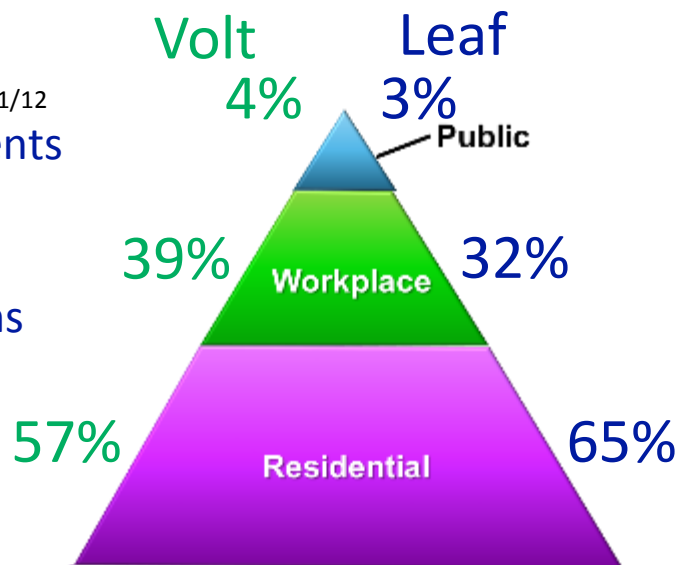
Access to workplace charging 1/1/13-12/31/13

- 57% of charging events are at home
- 39% at work
- 4% at other locations (e.g. public)

707 Leafs

Access to workplace charging 1/1/12-12/31/12

- 65% of charging events are at home
- 32% at work
- 3% at other locations (e.g. public)



Residential and workplace charging provide the vast majority of all charging.

Source: John Smart, INL, EV Project; Link to all reports = <http://avt.inel.gov/librarybydate.shtml>

<http://avt.inel.gov/pdf/EVProj/ChargingLocation-WorkplaceVoltsMar2014.pdf>

While customers express interest in these types of vehicles, they don't want to change their routines or significantly alter driving habits to accommodate new technologies



Owners indicate that they are willing to do whatever it takes to assimilate their PHEV/EV into their lifestyle

Intenders, while open to the idea of a PHEV/EV purchase or lease, do not want to change their lifestyle to accommodate the new vehicle

Specifically they tell us that . . .

- They don't want to have to do significant planning for trips
- They don't want to have to go out of their way to charge

**Need to simplify.
Need for continuing education.**

